

PLANT GUIDE MANAGEMENT AND USE OF

Crested and Siberian Wheatgrasses

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DESCRIPTION

Crested wheatgrasses *Agropyron cristatum* (L.) Gaertn.; *Agropyron desertorum* (Fisch. ex Link) J.A. Schultes; and Siberian wheatgrass *Agropyron fragile* spp. *sibericum* (Wild.) Melderis; are perennial grasses commonly seeded in the western United States. They are long-lived, cool season, drought tolerant, introduced grasses with extensive root systems.

Crested wheatgrass grows from 1 to 3 feet tall and seed spikes may be 1.5 to 3 inches long. Spiklets flattened, closely overlapping, located divergent (flatwise) at a slight angle on the rachis flower stem. The lemmas generally narrow to a short awn and glumes are firm, keeled, tapering into a short bristle. Culms are erect, in a dense tuft and leafy. Leaves are flat, smooth below, slightly coarse above and vary in width from 2 to 6 mm.

IMPROVED CULTIVARS

Crested wheatgrasses *Agropyron cristatum* (L.) Gaertn. (cristatum type) are not as drought tolerant as the *desertorum*, Hycrest or Siberian types. They are adapted to the Northwest, Intermountain, and Great Plains regions with at least 10 inches of annual precipitation. They do well on shallow to deep, moderately coarse to fine textured, moderately well to well drained and weakly acidic to moderately alkaline (saline and sodic) soils. Under alkaline conditions, vigor and production are reduced. The cristatum type was first recognized in 1950 as being different than other crested types. The cristatum type is shorter, denser, finer stemmed and less productive than the desertorum or Hycrest types at lower elevations and may exceed production of either at higher elevations. The cultivars; 'Douglas', 'Ephraim', 'Parkway', 'Roadcrest' and 'Ruff' are all cristatum type crested wheatgrasses.

'Douglas' was developed by ARS in Logan, Utah and released in 1994 in cooperation with the Utah Agricultural Experiment Station and NRCS. The breeding populations were derived from accessions from the former USSR, Iran and Turkey. One accession had very broad leaves and was used as the female parent in all crosses. 'Douglas' has larger seed than other cultivars and has excellent seedling vigor. It produces less forage than other cultivars, but is leafier and remains green longer suggesting a potential forage preference and higher fire resistance than previous releases of *Agropyron cristatum*. It is not recommended for turf applications, but may work very well in roadside applications. Certified seed is available and ARS in Logan, Utah maintains breeder seed.

'Ephraim' was developed by the Forest Service Shrub Laboratory in Provo, Utah and Utah Division of Wildlife Resources from seed originating in Turkey. It was released in 1983 by the developing agencies and in cooperation with NRCS and Agricultural Experiment Stations in Arizona, Idaho and Utah. It is rhizomatous, but the rhizomatous trait is generally not evident unless planted in higher precipitation zones above 14 inches. It is well adapted to disturbed areas, mine spoils, roadsides and turf applications. It is not well adapted to very silty soils. It is a good seed producer. Certified seed is available and breeder seed is maintained by Aberdeen PMC.

'Parkway' was developed by the Canada Department of Agriculture, Research Station, Saskatoon, Saskatchewan and released in 1969. It is recommended for hay and pasture, is slightly less leafy, but taller, better seed producer and has greater lodging resistance than the non-released cristatum types. It is not recommended for turf applications. Certified seed is available and Agriculture Canada, Research Station, Swift Current, Saskatoon, Saskatchewan, maintain breeder seed.

'Roadcrest' was developed by ARS in Logan, Utah and released in 1998. It is a long-lived perennial, and is significantly more rhizomatous than Ephraim, the only other rhizomatous crested wheatgrass cultivar. Roadcrest is recommended for use along roadsides or similar low-maintenance turf application areas in the 10 to 20 inch rainfall

areas. Certified seed is available and USDA ARS Forage and Range Research Laboratory at Logan, Utah maintain breeder seed.

'Ruff' was developed by ARS, Lincoln, Nebraska and released in 1974 by ARS and the Nebraska Agricultural Extension Service. It is recommended for a short season, spring forage crop, roadsides, parks, and playgrounds in low rainfall areas of the central Great Plains. It is recommended for turf applications. Certified seed is not available.

Crested wheatgrasses *Agropyron desertorum* (Fisch. ex Link) J.A. Schultes (desertorum type) is more drought tolerant than the cristatum type and about equal to or slightly more drought tolerant than the Hycrest type. It is not as drought tolerant as the Siberian type. The desertorum type is adapted to the Northwest, Intermountain and Great Plains regions with at least 8 inches of annual precipitation below 6500 feet elevation. It does well on shallow to deep, moderately course to fine textured, moderately well to well drained and weakly acidic to moderately alkaline soils. Under saline conditions, vigor and production are reduced. The desertorum type is considered more saline tolerant and equal to or more productive than other crested wheatgrass types. Hycrest is similar in long term production. The following cultivars; 'Nordan' and 'Summit' are desertorum type crested wheatgrasses.

ARS developed 'Nordan' at the Northern Great Plains Research Laboratory, Mandan, North Dakota. ARS and ND Agricultural Experiment Station released it in 1953. It is more uniform, erect, with more awnless seed and larger in size. The seed heads are more dense and compressed than those it was compared with. It has good seedling vigor and seed quality and long-term forage yields are as good or better than other types. It is very palatable in spring and fall, but less so in summer. Certified seed is available and the Great Plains Research Laboratory maintains breeder seed.

'Summit' was introduced from Western Siberian Experiment Station, Omsk, former USSR. Canada Department of Agriculture released it in 1953. It is considered very similar to 'Nordan'. Certified seed is available and the Canada Department of Agriculture, Saskatoon, Saskatchewan, maintains breeder seed.

Crested wheatgrasses *Agropyron cristatum* (L.) Gaertn. X *Agropyron desertorum* (Fisch. ex Link) J.A. Schultes (Hycrest type) is a hybrid between the cristatum and desertorum types which results in a plant with excellent seedling vigor.

ARS in Logan, Utah developed 'Hycrest' by crossing cristatum and desertorum type crested wheatgrasses. ARS, NRCS, and Utah Agricultural Experiment Station released it in 1984. It is easier to establish than either of its parents and is more productive during the establishment period than either parent. Long term productivity exceeds the cristatum type and is equal to the desertorum type. The leaves and stems are fine, very similar to the cristatum type. Good stands have been established in the 8 inch or greater precipitation zones. It is best adapted to 5,000 to 9,000 feet elevation zones, but good stands are common down to 2,500 feet. It does well on shallow to deep, course to fine textured, moderately well to well drained and weakly acidic to moderately alkaline soils. Under saline conditions, vigor and production are reduced. Certified seed is available and ARS, Logan, Utah, maintains breeder's seed.

ARS in Logan, Utah released 'CD-II' a selection of Hycrest in 1996 to ensure genetic purity of the cross. Characteristics and performance are the same as Hycrest.

Siberian wheatgrass *Agropyron fragile* spp. *sibericum* (Wild.) Melderis (Siberian type) is similar to the desertorum type crested wheatgrass, but is considered more drought tolerant than the cristatum, desertorum or Hycrest types.

'P27' was developed by the Aberdeen and Pullman Plant Materials Centers from seed originating from Kazakhstan and was leased in 1953 by NRCS, Aberdeen and Pullman PMCs and Idaho Agricultural Experiment Station. It is awnless, has finer leaves, and retains greenness and palatability later into the summer than other crested wheatgrasses. It yields less and has poorer seedling vigor than other crested wheatgrasses. It is best adapted to 8 inches and above annual precipitation and is noted for tolerating longer drought periods once established than other crested wheatgrasses. It is well adapted to light, droughty soils. Certified seed is available and breeders seed is maintained by Aberdeen PMC.

'Vavilov' was developed from seed originating from the former USSR, Turkey, and 'P-27' by ARS in Logan, Utah. ARS, NRCS and the Utah Agricultural Experiment Station released it in 1994. Seedling vigor is similar to 'Hycrest' and is consistently better than 'P-27'. It is more drought tolerant and better adapted to sandy soils than other crested wheatgrass types. It is best adapted to 8 inches and above annual precipitation up to 7,000 feet elevation and is noted

for tolerating longer drought periods once established than other crested wheatgrasses. It will not cross with other crested wheatgrasses. It is expected that 'Vavilov' will eventually replace 'P-27' on the commercial seed market. Certified seed is available and ARS Logan, Utah maintains breeder's seed.

USES

Grazing/rangeland/hayland - Crested wheatgrass is commonly recommended for forage production. It is palatable to all classes of livestock and wildlife. It is a preferred feed for cattle, sheep, horses and elk in spring and also in the fall if greenup occurs. It is considered a desirable feed for deer and antelope in spring and falls if greenup occurs. It is not considered a desirable feed for cattle, sheep, horses, deer, antelope and elk in summer. In spring the protein levels can be as high as 20 percent and decreases to about 4 percent as it matures and cures out. Digestible carbohydrates remain high throughout the active growth period. It is commonly utilized for winter forage by cattle and horses, but protein supplements are required to ensure good animal health. It is noted for its ability to withstand very heavy grazing pressure (65 percent utilization and greater) once stands are established. Crested wheatgrasses are good forage producers in the areas where best adapted, producing from 1.5 to 20 times the grazing capacity of the native and weedy species they replace which are generally in the bluebunch wheatgrass ecosystems. The best forage types in order are Siberian, desertorum, and Hycrest. The cristatum type is not considered a productive forage type.

Erosion control/reclamation - Crested wheatgrasses are well adapted to stabilization of disturbed soils. They compete well with other aggressive introduced grasses during the establishment period. They are not very compatible with slower developing natives which they out compete such as Snake River wheatgrass, bluebunch wheatgrass, thickspike wheatgrass, western wheatgrass and needlegrass species. Their drought tolerance, fibrous root systems, and good seedling vigor make these species ideal for reclamation in areas receiving 8 to 20 inches annual precipitation. In areas above 14 inches annual precipitation, the cristatum types may exhibit their rhizomatous traits and make excellent low maintenance lawns when broadcast seeded to establish thick lawns. For most uses, crested wheatgrasses are not recommended above 12 inches of precipitation because better species alternatives are available. These grasses can be used in urban areas where irrigation water is limited to provide ground cover and to stabilize ditchbanks, dikes, pipelines, powerlines and roadsides.

Wildlife - Birds and small rodents eat crested wheatgrass seeds; deer, antelope and elk graze it, especially in spring and fall. Upland and songbirds utilize stands for nesting.

ADAPTATION

Crested wheatgrasses are adapted for non-irrigated seedings where annual precipitation averages 8 inches or more (cristatum type should average 10 inches or more) and where the frost-free period is generally less than 120 days. The desertorum and Hycrest types are superior above 8 inches annual precipitation in spring recovery and grazing readiness. On droughty sites with 8 inches or less annual precipitation, Siberian wheatgrass may be the best choice, it is known to surpass the desertorum and Hycrest types in rate of establishment, stand persistence, and total forage yield on the more arid sites. Siberian has been seeded in areas with as little as 5 inches of precipitation with some success. Crested wheatgrass should generally be seeded below 7,000 feet elevation. The cristatum and Hycrest types do well up to 9,000 feet elevation. Crested wheatgrass does well on shallow to deep, moderately coarse to fine textured, moderately well to well drained and weakly acidic to moderately alkaline soils. Under saline conditions, vigor and production are reduced. Cristatum types are not well adapted to silty soils. Siberian types are well adapted to light, droughty soils. They are cold tolerant, can withstand moderate periodic flooding in the spring, and are very tolerant of fire. They will not tolerate long periods of inundation, poorly drained soils or excessive irrigation.

ESTABLISHMENT

Crested wheatgrass should be seeded with a drill at a depth of 1/2 inch or less on medium to fine textured soils and 1 inch or less on coarse textured soils. Single species seeding rates recommended for all crested wheatgrasses are 5 pounds Pure Live Seed (PLS) or 20 to 30 PLS per square foot. Single species seeding rates recommended for Siberian wheatgrass is 6 pounds Pure Live Seed (PLS) or 24 PLS per square foot. If used as a component of a mix, with alfalfa, sainfoin, yellow sweetclover or cicer milkvetch, adjust to percent of mix desired. For mined lands and other harsh critical areas, the seeding rate should be increased to 40 to 50 PLS per square foot. Mulching and light irrigation's on highly disturbed areas are beneficial for stand establishment.

The best seeding results are obtained from seeding in very early spring on heavy to medium textured soils and in late fall on medium to light textured soils. Late summer (August - mid September) seedings are not recommended unless irrigation is available. Seedling vigor is good to excellent.

Crested and Siberian wheatgrasses establish fairly quickly, with 'Hycrest' and 'Vavilov' noted for the best seedling vigor. They should not be seeded with native species. Under favorable conditions they are good weed barriers.

Stands may require weed control measures during establishment, but application of 2,4-D should not be made until plants have reached the four to six leaf stage. Mow when weeds are beginning to bloom to reduce weed seed development. Grasshoppers may also damage new stands and other insects and use of pesticides may be required.

MANAGEMENT

Crested wheatgrass greens up in the spring about 10 days after bluegrass species and about 2 to 3 weeks earlier than native wheatgrasses. They make good spring growth, little summer growth and good fall growth if moisture is available.

Crested wheatgrasses have good palatability for livestock and some wildlife (see USES). Livestock and wildlife will graze Crested wheatgrass throughout the spring growing season until they becomes too coarse toward summer and again in fall if regrowth occurs. Established stands can withstand very heavy grazing.

New stands of crested wheatgrass should not be grazed until they are firmly established and have started to head out. Six inches of new growth should be attained in spring before grazing is allowed in established stands. Three inches of stubble should remain at the end of the grazing season to maintain the long-term health of the plant. In addition, leaving three inches or more stubble will result in a 10 - 14 day earlier greenup in spring.

Crested wheatgrasses are low maintenance plants requiring little additional treatment or care. However, spring/fall deferment or grazing rotations are recommended to maintain plant health and to maximize forage production potential.

Crested wheatgrass is competitive with weedy species, but can be crowded out by some aggressive introduced weedy species and native woody species.

Crested wheatgrass can be used for hay production and will make nutritious feed, but is more suited to pasture use. Light infrequent applications of nitrogen (25 pounds/acre) and irrigation will increase total biomass production and lengthen the green period.

ENVIRONMENTAL CONCERNS

Crested wheatgrasses are long-lived, spread primarily via seed, but may also spread via rhizomes in the case of the cristatum types. They are not considered "weedy" or invasive species. Most seedings do not spread beyond original plantings, or if they do spread, the rate of spread is not alarming. They will cross with each other (exception Siberian types do not cross with other types), but do not cross with native species.

Crested wheatgrasses resist cheatgrass competition better than native species because it germinates earlier and grows more rapidly at colder temperatures. This is an important competitive advantage when dealing with winter annual species such as cheatgrass.

Full, properly managed stands of crested wheatgrass generally withstand encroachment by native grasses and forbs. When interseeded into native stands, crested wheatgrass commonly co-exists with native grass and forb. However, some natives (big sagebrush and rabbitbrush) often invade crested wheatgrass stands, especially if native seed sources are nearby.

Due to commonly being planted in monocultures (single species) stands in the past, some feel crested wheatgrasses are not ecologically appropriate. It is important to consider multiple species mixes to avoid this conception.

SEED PRODUCTION

Seed production of crested wheatgrasses has been very successful under cultivated conditions. Row spacing of 24 to 30 inches when irrigated and 36 inches or greater when dryland are recommended. Early spring or late fall seeding periods are recommended under dryland conditions and early spring, late fall or late summer (from mid August to mid September) are recommended under irrigated conditions.

Control weeds during stand establishment and long term management of stand by clipping, hand rouging or light rates of herbicide (2,4-D or Bromoxynil according to label) after the five-leaf stage. Apply phosphorus according to field test to supply needs for several year. Very little nitrogen should be applied during stand establishment. Make applications of nitrogen in fall following stand establishment in accordance with field test. Very early spring application of nitrogen may be beneficial on sandy soils to promote vegetative growth. When irrigated, apply adequate moisture for germination, establishment and to bring soils to field capacity. Following stand establishment, fertilize and irrigate soon after seed harvest in fall to stimulate seedhead primordia development. Do not stress plants during regrowth and tillering in the fall, late boot stage, and during pollination. Avoid irrigating during flowering.

Seed fields are productive for four to five years. Average production of 150 to 250 pounds per acre can be expected under dryland conditions in 14 inch plus rainfall areas. Average production of 450 to 550 pounds per acre can be expected under irrigated conditions. The seed heads do not readily shatter, but some shatter can be expected. Harvesting is best completed by direct combining when the top of the seedhead begins to shatter or windowing at hard dough stage and combining with pickup attachment in about 5 to 7 days. Seed is generally harvested in mid July to mid August.

Foundation and registered seed is available through the appropriate state Crop Improvement Association or commercial sources to grow certified seed.

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